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10/663,700

09/17/2003

Shinji Kimura

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EXAMINER

WALTER, CRAIG E

ART UNIT

PAPER NUMBER

2188

MAIL DATE

DELIVERY MODE

05/14/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary**

Application No.

10/663,700

Applicant(s)

KIMURA ET AL.

Examiner

Craig E. Walter

Art Unit

2188

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 March 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-14 and 19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Status of Claims***

1. Claims 1-14 and 19 are pending in the Application.  
Claims 1, 3, 4, 6, 9-12 and 19 have been amended.  
Claims 15-18 remain cancelled.  
Claims 1-14, and 19 are rejected.

### ***Response to Amendment***

2. Applicant's amendments and arguments filed on 5 March 2007 in response to the office action mailed on 18 January 2007 have been fully considered, but they are not persuasive. Therefore, the rejections made in the previous office action are maintained, and restated below, with changes as needed to address the amendments.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 19 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 19 recites the limitation "the network" in line 12 of the claim. There is insufficient antecedent basis for this limitation in the claim. More specifically, "a network" is not previously set forth within the claim.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 3, 4, 8, 9, 11-13 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arimilli et al. (US PG Publication 2003/0009640 A1), hereinafter Arimilli, and in further view of Moran et al. (US Patent 7,139,890 B2), hereinafter Moran.

As for claim 1, Arimilli teaches a cache control method in a computer system that includes a storage device having a plurality of physical devices for storing data (Fig. 1 (elements 14 depict multiple processing devices, each of which comprising a physical device (i.e. cache for storing data))), at least one client (Fig. 1, element 12), a relay device which relays data between said storage device and the at least one client (Fig. 1, element 15 – the switch connects the client and processing devices), a cache disk module for caching processed data being relayed between said storage device and said at least one client (Fig. 1, element 22 – the cache is used to store information sent between the client and NUMA computer system node (Fig. 1, element 12)), and a network for connecting said storage device, said at least one client and said relay device to each other (the processing devices, client, switch, and arrows depicting paths of communication comprise the network), the cache control method comprising:

a relay device, and a client device connected mutually via a network (referring to Fig. 1, the system includes a plurality of host/client nodes (12) which are connected via a network switch (15). Each node contains, *inter alia*, a memory (26) and a cache (22)), the cache control method comprising:

relating data processed in the computer system with attribute data which configures a caching operation of the cache disk module that caches the processed data on the network (referring to Fig. 4, the page table entry (PTE) stores, *inter alia*, a physical page number (98), a no intent to cache bit (110), and a node write through bit (108) – paragraphs 0046 through 0047, all lines. The latter two bits help the system to determine if the associated data should be cached, or not cached (i.e. written through to the memory) – paragraphs 0048 through 0049, all lines); and

mediating the processed data between the storage device and the at least one client device via the network without the cache operation of the cache disk module when the attribute data prohibits the caching operation (data received by a node within the network is processed within the node based on the status of a plurality of write through indicators (when an indicator is set, the data is written back to the main memory rather than being cached – paragraph 0013, all lines). Note paragraphs 0025 through 0026, all lines, describe data sharing among the nodes and additional attached devices).

wherein a plurality of virtual volumes are formed on said physical device, and each of said at least one client is assigned at least one of said virtual volumes (paragraph 0040 and 0046, all lines – the physical memory of each

device is abstracted in virtual addresses which are comprised of virtual segments/pages (i.e. volumes)),

wherein said attribute data is held in a cache attribute management table which stores a plurality of entries each of which sets a corresponding relation between identification information identifying one of said virtual page/segment (Fig. 4, element 92 – paragraph 0046, all lines), and an indication whether data stored in said one of said physical devices is cacheable or not (when an indicator is set, the data is written back to the main memory rather than being cached – paragraph 0013, all lines), and

wherein said each entry of said cache attribute management table further sets a corresponding relation between an indication as to whether data to be read from a physical device forming part of said one of said virtual volumes is cacheable or not and an indication as to whether data to be written to said physical device forming part of said one of said virtual volumes is cacheable or not (paragraph 0013 – Arimilli clearly discloses the use of a write through indicator. The write through indicator serves as flag to determine if data access (i.e. data written to a physical device, or read from a physical device) is to be written through (i.e. not-cached) or not written through (i.e. cached). Since this indicator serves as an indication of when and when not to cache data access requests, it serves as an indicator whether data to be written to and read from, the physical device should be cached or not).

Despite these teachings Arimilli fails to specifically teach his cache disk modules as being located in the relay device (i.e. switch). Additionally he fails to teach storing identification information identifying one of the physical devices (he only teaches identifying virtual addresses/volumes).

Moran however teaches a method and an arrangement to interface memory, which includes a switch (i.e. hub – Fig. 1, element 110, which contains a memory, element 130). Additionally, Moran teaches storing a device ID in a table in order for the system to identify a memory or memory location to be referenced (col. 11, lines 26-44).

It would have been obvious to one of ordinary skill in the art at the time of the invention for Arimilli to further include Moran's method and an arrangement to interface memory into his own NUMA data processing system. By doing so, Arimilli could benefit by having a more secure NUMA system which can mitigate the risk of potentially hostile code to access the data within his system as taught by Moran in col. 1, lines 36-60.

Claims 3, 11 and 19 are rejected based on the same rationale as claim 1.

As for claim 4, Arimilli teaches the relay device according to claim 3, further comprising:

A volatile memory for the caching, wherein the mediation unit mediates the processed data between the storage device and the at least one client device via the network, by primarily using the volatile memory and secondarily using the cache disk module (referring to paragraph 0004, all lines, Arimilli teaches the use of volatile memory (i.e. RAM) as being used in a computer system for caching. Additionally note (referring to Fig. 1), Arimilli teaches each node as receiving data

from the network via the node controller (16), at which point the data must traverse a path via one or more of the processing units (i.e. element 14) before it is stored in memory (26). In other words, the primary path is through the processing unit (containing the cache). By default the data is stored within the cache unless caching indicators are set to indicate that the data is to be written directly through (without caching) to the system memory).

As for claim 8, Arimilli teaches the relay device according to claim 3, wherein the attribute data is included in the processed data, and the obtaining unit obtains the attribute data from the processed data (paragraph 0048, all lines, the CPU sends the data along with the indicator to instruct the hierarchy not to hold the data in cache).

As for claims 9 and 13, Arimilli teaches the relay (and storage) device according to claims 3 and 11 respectively, wherein the attribute data is associated with a data storage block of the storage device for storing the processed data (paragraphs 0046 through 0047, all lines, the no intent to cache and node write through fields are stored within each PTE entry, which stores each corresponding physical page number), and the obtaining unit obtains the associated attribute data from the storage device via the network in advance of mediation by the mediation unit (the CPU must obtain and process the indicator bits stored, then subsequently notify the node of the status before the mediation unit can determine if the data from the network is to be written to the cache or through to the system memory – paragraphs 0048 through 0049, all lines).

As for claim 12, Arimilli teaches the storage device according to claim 11, wherein the relation unit comprises:



an additional module that adds the attribute data to the processed data, and the added attribute data is mediated together with the processed data (paragraph 0048, all lines, the CPU sends the data along with the indicator to instruct the hierarchy not to hold the data in the cache).

5. Claims 2, 5-7, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Arimilli (US PG Publication 2003/0009640 A1) and Moran (US Patent 7,139,890 B2) as applied to claims 1, 3, and 11, and in further view of Benantar (US PG Publication 2002/0144119 A1).

As for claims 2 and 5, though Arimilli teaches all of the limitations of claim 1, he fails to teach encrypting the processed data. Benantar however teaches network authentication processing via data encryption. More specifically, Benantar teaches encrypting processed network data via a public key (Fig. 6, element 606).

As for claim 6, though Arimilli fails to teach the limitations of this claim, Benantar however discloses an encryption obtaining unit that obtains encryption attribute data related with the processed data, wherein the encryption attribute data configures an encryption operation that encrypts the data (referring again to the flow chart illustrated by Fig. 6, an attribute certificate is generated based on the keys which are used to determine how the encryption process is to be carried out). Additionally, Benantar teaches an encryption unit that encrypts the data when the encryption attribute data requires the encrypting operation (Fig. 6 demonstrates the flow of how the encryption process occurs based on generating the certificate from the public and private key data).

As for claim 7, though Arimilli fails to teach storing key data, Benantar discloses a volatile memory for storing key data used for generating the encrypted data (referring to Fig. 5, the keystore (518) is used to store the key data. Note paragraph 0031, all lines, the storage areas are described as either consisting of non-volatile or volatile memory).

As for claim 14, though Arimilli teaches all of the limitations of claim 11, he fails to the remaining limitations of this claim. Benantar however teaches a key management unit that manages key data used for encrypting the data cached in the cache disk module (Fig. 5, element 510 illustrates the SSO manager which manages the keys in the keystore (518) used to encrypt the data). Additionally, Benantar discloses a key notification module that notifies the node device of the managed key data (referring again to Fig. 6, the authentication information generated (which was based on the key information) is transmitted to the client to notify the client of the key information used to encrypt the data).

It would have been obvious to one of ordinary skill in the art at the time of the invention for Arimilli in further view of Moran to further include Benantar's encryption system into his own NUMA data processing system. By doing so, Arimilli would benefit by having a means of protecting data within nodes from unauthorized access across his network system as taught by Benantar (paragraph 0004, all lines).

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Arimilli (US PG Publication 2003/0009640 A1) and Moran (US Patent 7,139,890 B2) as applied to claim 3 above, and in further view of Matsumoto (US Patent 5,737,522).

As for claim 10, though Arimilli teaches obtaining attribute data from the data processed within the network, and teaches switching between caching and not caching of the processed data, he fails to teach notifying the occurrence of an error in the at least one client device as claimed by Applicant. Matsumoto however teaches a serial I/O circuit with an automatic transfer function, which notifies the system if an error occurred in the data (col. 6, lines 6-56).

It would have been obvious to one of ordinary skill in the art at the time of the invention for Arimilli in further view of Moran to further include Matsumoto's automatic transfer circuit into his own NUMA data processing system. By doing so, Arimilli would benefit by having a means notifying nodes within his network system of data errors. By exploiting Matsumoto's notification process, Arimilli could greatly reduce the amount of labor required to re-transfer the correct data as taught by Matsumoto in col. 5, line 54 through col. 6, line 3.

### ***Response to Arguments***

7. With respect to the claim objections and 35 U.S.C 112(2) rejections set forth in the previous correspondence, Applicant's amendment overcomes all of these objections and rejections with the exception of rejection set forth against "the network" as recited in claim 19. This phrase lacks antecedent basis and is addressed *supra*.

8. Applicant's amendments and arguments with respect to the 35 U.S.C. 103 rejections have been fully considered, however they are not persuasive.

Applicant arguments with respect to the 35 U.S.C. 103 rejections begin on page 10 of the remarks section, and include a description of the instant invention, and are further alleged to overcome all previously cited art. Beginning on page 14, Applicant asserts that Arimilli fails to teach “a relay device including a cache disk module for caching data being transferred between the storage device and the at least one client, and a network for connecting the storage device, the at least one client and the relay device to each other.” Applicant continues, “[s]uch a structure is clearly not taught or suggested by Arimilli. In Arimilli there is no teaching or suggestion that the nodes 12 are connected between a client and a storage device as in the present invention as recited in the claims.”

This argument however is not persuasive. It is clear from Examiner's previous rejection that Arimilli's nodes 12 were mapped to Applicant's client device as per page 5, paragraph 006 of the previous Office action. More specifically, nodes 12 (client) are used to connect to a storage system 10 containing a storage device (storage device), via a switch 15 (relay device). It is further clear from Examiner's previous rejection that the teachings of Arimilli in view of Moran, rather than Arimilli alone, were used to address a relay device including a cache disk module for caching data being transferred between the storage device and the at least one client. Pursuant to MPEP § 2145, “[o]ne cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed.

Cir. 1986).” Hence, Applicant has failed to rebut Examiner’s clearly and properly established *prima facie* case of obviousness for this claim.

Applicant further contends, “the present invention as recited in the claims provides that the attribute data is held in a cache attribute management table which stores a plurality of entries each of which sets a corresponding relation between identification information identifying one of the virtual volumes, identification information identifying one of the physical devices and an indication whether data stored in the one of said physical devices is cacheable or not. There is no teaching or suggestion in Arimilli of a cache attribute management table as recited in the claims.” Applicant continues on page 15, “[a]t no point is there any teaching or suggestion in Arimilli of the above described features of the present invention particularly regarding the setting of a corresponding relation between identification information identifying one of the virtual volumes, identification information identifying one of the physical devices forming a part of the one virtual volume and an indication whether data stored in the one of said physical devices is cacheable or not in a cache attribute management table.”

This argument however is not persuasive. It is clear from the previous rejection that the teachings of Arimilli in view of Moran were required to meet this limitation, rather than Arimilli alone as argued by Applicant. More specifically, page 7 of the previous Office action clearly indicates that Arimilli in further view of Moran, not Arimilli alone, teaches storing identification information related to physical devices and virtual volumes. Again, it is improper for Applicant to assert a case of non-obviousness by attacking reference individually.

Applicant further asserts, “[n]amely there is no teaching or suggestion in Arimilli that each entry of the cache attribute management table further sets a corresponding relation between an indication as to whether data to be read from a physical device forming part of the one of the virtual volumes is cacheable or not and an indication as to whether data to be written to the physical device forming part of the one of the virtual volumes is cacheable or not as in the present invention.”

This argument however is not persuasive. Paragraph 0013 of Arimilli clearly discloses the use of a write through indicator. The write through indicator serves as flag to determine if data access (i.e. data written to a physical device, or read from a physical device) is to be written through (i.e. not-cached) or not written through (i.e. cached). Since this indicator serves as an indication of when and when not to cache data access requests, it serves as an indicator whether data to be written to and read from, the physical device should be cached or not.

Applicant continues on page 16 with the following statement: “Thus, as now recited in the claims the user can identify a particular physical device forming a part of a virtual volume for which caching is to be performed and the user can further identify for that particular physical device that caching is performed only with respect to data forming a part of, for example, a write operation. Such features are clearly not taught or suggested by Arimilli.”

This argument however is not persuasive, since such alleged “features” are not recited in Applicant’s instant claim. Further, Examiner wishes to reassert that it is Arimilli in view of Moran, not Arimilli alone, which discloses identifying when device

caching is, and is not performed via identification information relating physical devices and virtual volumes.

Applicant further asserts on page 16, "Arimilli, however does not teach or suggest the data caching control in the network switch 15 as in the present invention as now recited in the claims. Further, PTE 82 in Arimilli is the data that CPU 20 refers to and is not the data that is transmitted to the network switch 15 as in the present invention. Thus, the network switch 15 of Arimilli is incapable of carrying out data caching control with PTE 82 as in the present invention as now recited in the claims."

This argument however is not persuasive. More specifically, Examiner acknowledges that claim 1 recites a relay device as including a cache disk module, however maintains that it is Arimilli in view of Moran, not Arimilli alone, that disclose this feature (see page 7 of the previous Office action). Examiner maintains based on this rejection, that Arimilli in view of Moran teach a relay device as maintaining caching functions via the use of a cache disk module. Applicant failed to address whether Arimilli in view of Moran disclose a cache disk module located in the relay device, hence did not sufficiently rebut Examiner's clearly established a *prima facie* case of obviousness for this limitation.

Lastly, Applicant asserts that neither Moran, nor Benantar, nor Matsumoto teach several salient features of the invention, however Examiner previously relied on each of their respective teachings in combination with Arimilli to assert a *prima facie* case of obviousness. These very general arguments are not persuasive, as Applicant failed to address if Arimilli in view of Moran, or Arimilli in view of Moran in further view of

Benantar, or Arimilli in view of Moran in further view of Matsumoto render any or all of the claims obvious. Pursuant to MPEP § 2145, "[o]ne cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)." Hence, Applicant has failed to rebut Examiner's clearly and properly established *prima facie* case of obviousness for this claim.

### ***Conclusion***

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

10. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

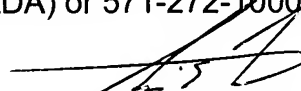
11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig E. Walter whose telephone number is (571) 272-8154. The examiner can normally be reached on 8:30a - 5:00p M-F.



Art Unit: 2188


12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hyung S. Sough can be reached on (571) 272-6799. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

13. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Craig E Walter  
Examiner  
Art Unit 2188

CEW



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5-10-07